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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/902,243 | 07/10/2001 | Jae-Phil Boo | SAM-0219 | 8274 |

7590 11/29/2002
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EXAMINER

PHAM, LONG

ART UNIT PAPER NUMBER

2814

DATE MAILED: 11/29/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/902,243

Applicant(s)

BOO ET AL.

Examiner

Long Pham

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Rejections and/or objections necessitated by the amendments

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

1. Claims 1, 2, 3, 4, 5, 6, 7, 8, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over the applicant's admitted prior art (AAPA) of this application in view of Liu et al. (US '641).

AAPA teaches a method of fabricating a non-volatile memory device having a tunnel insulating layer 22, comprising (see figures 1A-1B and 2A-2D and Description of the Related Art on pages 1-5 of this application): sequentially depositing said insulating layer, a conductive layer 23, and a first insulating layer 24 over a semiconductor substrate 21, said tunnel insulating layer including at least two portions of different thicknesses wherein said conductive layer serves a floating gate in a transistor device formed as part of a memory cell in the memory device; selectively etching the resultant structure to a given depth to form trenches; depositing a second insulating layer 25 over said structure including said trenches; selectively removing said second insulating layer so as to form element isolation regions composed of trenches filled with said second insulating layer; and removing said first insulating layer to expose the conductive layer.

AAPA fails to teach that the second insulating layer is selectively removed until the surface of the second insulating layer is substantially even with a surface of the conductive layer by chemical mechanical polishing process

using the conductive layer as an etching stop layer as recited in present claim 1.

Liu teaches that a second insulating layer 17 that fills the trench 12 is selectively removed until the surface of the second insulating layer is substantially even with a surface of the a conductive layer 21 by chemical mechanical polishing process using the conductive layer as an etching stop layer. See figures 2A-2G and col. 2, line 25 to col. 3, line 30.

It would have been obvious to ***one of ordinary skill in the art of making semiconductor devices*** to selectively remove the second insulating layer by chemical mechanical polishing process using the conductive layer as an etching stop layer in the method of AAPA because in doing so the problem of kink effect is eliminated. See col. 3, lines 15-25.

With respect to claim 9, it would have been obvious to ***one of ordinary skill in the art of making semiconductor devices*** to determine the workable or optimal range for the selectivity of CMP process through routine experimentation and optimization to obtain optimal or desired device performance because the selectivity is a result-effective variable and there is no evidence indicating that the thickness for the selectivity is critical and it has been held that it is not inventive to discover the optimum or workable ranges of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05.

AAPA teaches that the conductive layer has a thickness but fails to teach the range for the thickness as recited in present claim 3.

However, it would have been obvious to ***one of ordinary skill in the art of making semiconductor devices*** to determine the workable or optimal range for the thickness for the conductive layer through routine experimentation and optimization to obtain optimal or desired device performance because the

thickness for the conductive layer is a result-effective variable and there is no evidence indicating that the thickness for the conductive layer is critical and it has been held that it is not inventive to discover the optimum or workable ranges of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05.

AAPA fails to teach that the first insulating layer is made of silicon nitride (SiN) as recited in present claim 4.

However, it is well-known to ***one of ordinary skill in the art of making semiconductor devices*** that silicon nitride is used as insulating material. AAPA teaches that the first insulating layer has a thickness but fails to teach the range for the thickness as recited in present claim 5.

However, it would have been obvious to ***one of ordinary skill in the art of making semiconductor devices*** to determine the workable or optimal range for the thickness for the insulating layer through routine experimentation and optimization to obtain optimal or desired device performance because the thickness for the conductive layer is a result-effective variable and there is no evidence indicating that the thickness for the conductive layer is critical and it has been held that it is not inventive to discover the optimum or workable ranges of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05.

With respect to present claim 6, AAPA further teaches that the second insulating layer is selectively etched through photolithography, the first and second insulating layers are flattened through a CMP process, and the flattened first insulating layer is selectively removed but fails to teach the removal of the flattened insulating layer is done by photolithography as recited in present claim 6.

However, it is well-known to *one of ordinary skill in the art of making semiconductor devices* that photolithography is used to remove insulating material.

AAPA fails to teach that the second insulating layer for filling the trench isolation is made HDP as recited in present claim 8.

However, it is well-known to *one of ordinary skill in the art of making semiconductor devices* that HDP is used in filling trench isolation.

2. Applicant's arguments with respect to claims 1-9 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

3. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Long Pham whose telephone number is 703-308-1092. The examiner can normally be reached on M-F, 8:30AM-5:00PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 703-308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are 703-746-4082 for regular communications and 703-746-4082 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.



Long Pham

Primary Examiner

Art Unit 2814

L.P.

November 25, 2002